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Short Communication

Determination of arsenic contamination in ground water of Gorakhpur District by using hydride generation atomic absorption spectrophotometer

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Abstract

Present study has been carried out for the determination of Arsenic content in Gorakhpur district. Arsenic content was analyzed by using HG-AAS. The physico-chemical parameters of Gorakhpur district was also analyzed for the detection of ground water quality. For this study Ground water samples are collected from twenty sampling areas of Gorakhpur district. The samples were prepared for analysis with the help of HG-AAS. HG-AAS is very simple and unique technique for the detection of metal analysis in water, urine, and plant samples. Arsenic content is very toxic for human being. The water quality parameters like Nitrate, Fluoride, Iron, Chloride, Total hardness ph, EC, TDS, Alkinity and Turbidity. The result shows that most of the analyzed parameters from sampling sites are more or less within the limit of WHO.

Keywords: Arsenic, HG-AAS, Physic- chemical parameters.

Introduction

Water is very necessary resources for human being. Our body contains 70% weight of water. Without water we can't live on earth. Water present mainly in three different phases which are solid, liquid and gas. Water stimulates all biological activity and also as internal and external medium for several organisms. In this planet 97.2% water is salty and only 3% is fresh water. Ground water is very valuable for its property more than surface water[1]. According to WHO In human being 80% disease are caused by water. When Ground water is getting contaminated it could not be recovered back again. Water quality index is best coptent for human being to transfer information for interested people. It is a best tool for ground water assessment and sustainability[2]. Arsenic pollution in soil and water is very critical problem for the earth. Arsenic pollution in soil and water is caused by some naturally and anthropogenic activities. Arsenic creates contamination in human and living being through soil and water by food chain and food web[3]. Arsenic is very serious issue for human being it causes various diseases like skin cancer, cardiovascular, neurological, hematological, and respiration problems[4]. HG-AAS is a very easy and excellent technique[5].

Materials and methods

Study area: The district Gorakhpur is located between Lat. 26º13'N and 27º29'N and Long. 83º05'E and 83º56'E. According to the Central Statistical Organization the district covered an area 6,316 sq. Km. Gorakhpur district is divided in to seven Tehsil and these seven Tehsil are further divided into 14 blocks. Samples are collected from these blocks.

Sample collection and preservation of ground water samples: Ground water samples are collected from different sampling sites of Gorakhpur district. Samples are collected with hand pumps in 2 liter plastic bottles from twenty sites of Gorakhpur district.

Water analysis: The physical chemical parameters are analyzed by these collected Ground water samples. These parameters are pH, EC, Turbidity, TDS, Iron, Alkalinity, Chloride, Nitrate, Fluoride, Total Hardness and Arsenic.

Digestion of water samples: For the digestion of Ground water sample, we take 100 ml ground water sample in Beaker and add 5 ml conc. HNO_3 then cover beaker with watch glass. Place the sample on hot plate at 90^0C and evaporate to all volume till 5 ml then cool the sample and add again 5 ml conc. HNO_3. Then again the samples are placed for digestion when 3 ml impurities left then cool the sample. Then beaker and watch glass are washed with distilled water and then filter the sample for removable of silicate and other insoluble impurities. Now make the sample for final volume up to 100 ml with 1% HNO_3. Then sample are now ready for analysis by AAS[6].

Results and discussion

The Result shows all the values of physic chemical parameters and Arsenic concentration of Ground water samples collected from twenty sites. These values are given in a Table-1.

Iron: In ground water Iron occurs naturally as a mineral from sediment and rocks or from mining, industrial waste, and corroding metal. The values of iron have been found between 0.12 to 0.20 mg/l[7].

Fluoride: Fluoride is present in nature in the forms of Rock, Phosphate triphite and phosphorite crystal etc[8]. According to WHO permissible limit of Fluoride in Ground water is 1 to 1.5 mg/l. The range of fluoride have been found between 0.15 to 1.0 mg/l.

pH: The pH represent the –ve log of H_2 ions of a solution. The Value of pH ranges from 7 to 14. Where pH below 7 represent acidic and above 7 to 14 represent alkaline and 7 is neutral[9].

TDS: TDS is the difference between total solid and suspended solid. TDS is used for the determination of total dissolved solid by the help of filtrate. It is also measured by conductivity meter. According to WHO the permissible limit of TDS is 500mg/l [9].

Turbidity: Turbidity represents the transparency of water sample. It is caused by suspension of particles. Turbidity is determined by Turbiditymetry. It is also measured by its effect on separation of light, which is known as Nephlometry. According to WHO the value of Turbidity occurs between 1 to 5 NTU[9]. The range of turbidity has been found in between 0.1 to 1.5 NTU.

Total hardness: According to WHO permissible limit of total hardness is lies between 200-600 mg/l. Total hardness is occur mainly due to presence of Ca, Mg, and Fe[10]. The range of total hardness has been found between the ranges of 190-358 mg/l.

Alkinity: Alkalinity is known as addition of compound present in water that offer pH to increase from alkaline side to neutrality. It can also be determined by Titration process[10]. The ranges of Alkalinity have been found between 55 to 85 mg/l.

Chloride: Chloride is present in all type of water either Ground or surface water[10]. The range of chloride has been found between 16-65 mg/ l.

Nitrate: The presence of Nitrate in waste water mainly in the form of N compound (of its oxidizing state). Many chemical and fertilizer factory with the help of degraded vegetables and domestic and industrial discharge produced Nitrate[11]. The range of nitrate occurs between 12-38 mg/l. According to WHO the Permissible limit of Nitrate is 45mg/l.

Table-1: Shows physic chemical parameters of Gorakhpur district.

Sampling area	pH	EC	TDS	Turbidity	Total Hardness	Alkinity	Chloride	Nitrate	Flouride	Iron	Arsenic
Jungal kauria	7.4	457	250	0.1	200	75	36	18	1.0	0.16	3.25
Khorabar	6.9	586	280	0.2	250	60	36	25	0.25	0.14	2.01
Sardarnagar	7.3	358	350	0.5	275	85	16	15	0.42	0.12	2.25
Sahjanva	7.3	486	400	0.4	225	65	48	20	0.23	0.12	0.35
Khajni	7.2	987	500	1.3	358	75	35	14	0.35	0.15	2.14
Campierganj	7.5	1160	254	1.5	250	60	40	19	0.25.	0.18	3.08
Kauriram	6.9	768	350	0.9	260	55	50	25	0.31	0.16	4.09
Badhalganj	7.8	1258	600	1.2	350	75	45	38	0.23	0.13	5.12
Ururva	6.8	1058	350	0.6	280	85	48	28	0.48	0.15	2.08
Gorakhnath	6.5	1070	380	0.9	320	80	50	35	0.28	0.20	0.56
Medical collage	6.7	548	450	0.5	190	75	55	12	0.56	0.18	0.25
IIT	7.1	978	250	0.7	220	60	65	30	0.38	0.28	1.30
Taramandal	7.2	546	300	0.6	250	75	48	24	0.75	0.30	0.45
Reti	6.9	348	385	0.5	275	55	40	14	0.28	0.17	1.21
Basaratpur	6.5	507	245	0.2	320	65	52	30	0.34	0.19	2.85
Miyabajar	7.2	475	450	0.8	350	75	36	28	0.63	0.17	4.25
Rajghat	7.2	658	550	0.6	265	70	50	24	0.42	.025	2.05
Bichichia colony	6.5	586	435	0.1	225	58	45	19	0.15	0.16	0.14
Golghar	6.8	485	300	0.0	352	65	36	17	0.34	0.18	0.12
Mohaddipur	6.5	890	350	0.7	300	75	20	15	0.25	0.13	2.34
Maximum	7.8	1258	600	1.5	358	85	65	38	1.0	0.30	5.12
Minimum	6.5	348	245	0.0	190	55	16	12	0.15	0.12	0.12

Arsenic: Arsenic is heavy metal, which is toxic for human being. It causes skin cancer and another dermal disease. Arsenic is detected by HG-AAS, which is simple and easy process for arsenic detection. In Gorakhpur district water sample are detected by AAS. The range of arsenic has been found between 0.12 to 5.12 PPb. As per WHO permissible limit of arsenic is 50PPb. so concentration of Arsenic in Gorakhpur district is below the permissible limit.

Conclusion

The results of this work shows that almost all physico- chemical parameters are under the permissible limits. In this study various parameters are studied like pH, EC, TDS, Turbidity, Total Hardness, Iron, Alkinity, Chloride, Fluoride, Nitrate and mainly Arsenic. All the above result shows that ground water quality is not up to the limit. But we can't say that the ground water of Gorakhpur district is completely safe for our health because there are some parameters which values have above the permissible limit. But in case of Arsenic, these values are within the permissible limit. So in the sense of Arsenic concentration we can say that the Ground water of Gorakhpur district is completely safe for human health.

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